

Abstract

A coating resin that is thermoplastic, exhibits good appearance, solvent resistance and adherence and is excellent in abrasion resistance; and a coating liquid or coating film thereof. In particular, a (meth)acrylic copolymer resin (A) produced by radical polymerization of 4 to 50 mass% of (meth)acrylic acid (a-1), 0.5 to 17 mass% of (meth)acrylamide (a-2), and 35 to 95.5 mass% of a compound having reactive unsaturated bond other than the compounds (a-1) and (a-2). With respect to the coating film produced therefrom, both the glass transition temperature Tg1 measured by means of a rigid-body pendulum type viscoelasticity measuring instrument and the glass transition temperature Tg2 measured by means of a differential scanning calorimeter (DSC) are 110°C or higher. The coating film is an abrasion resistant film whose abrasion resistance measured in accordance with the Taber abrasion testing method is 80 rotations or greater.

Please amend Table 1-1 at page 16 as follows:

Table 1-1: Examples

		Used material: Theoretical Tg (°C) of homopolymer is shown in parentheses	Examples 1 to 8							
			-1	-2	-3	-4	-5	-6	-7	-8
(A) (Meth) acrylic copolymer resin	(a-1) (Meth) acrylic acid	Mac (186) (130)	100	200	250	60	400	200	200	
		Aac (104) (106)								200
	(a-2) (Meth) acrylic acid amide	MAM (256)	40	60	800 80	10	10	60	60	150
	(b) Compound having a reactive unsaturated bond	ST (104) (100)					120			
		MMA (108) (105)	502	517 515	400	808	400	517 515	517 515	532
		EA (-22)		25			70	25	25	118
		nBA (-56) (-54)				122				
		nBMA (20)	358	200				200	200	
		iBMA (65) (67)			27 270					
		2EHA (-35) (-85)								
		Total	1000	1000	1000	1000	1000	1000	1000	1000
	Theoretical Tg3 (°C)		80 75.0	100 90.1	120 108.1	80 76.4	120 101.5	100 90.1	100 90.1	100 98.9
(B) Solvent	(c)	IPA	750	1000		1000	1000		1000	
		PM			1000			1000		1000
	(d)	TOL	250							
		MEK	500	500	500	500	500	500	500	500
		TOTAL	1500	1500	1500	1500	1500	1500	1500	1500
Coating solution		Solids content (%)	40	40	40	40	40	40	40	40
		Molecular weight (Mw)	41000	66000	82000	43000	43000	58000	58000	58000

Please amend Table 1-2 at page 17, as follows:

Table 1-2: Comparative Examples

		Used material: Theoretical Tg (°C) of homopolymer is shown in parentheses.	Comparative Examples 1 to [(6)] 5					
			-1	-2	-3	-4	-5	-6
(A) (Meth) acrylic copolymer resin	(a-1) (Meth) acrylic acid	Mac (186) (130)		20	100	510	100	60
		Aac (104) (106)						
	(a-2) (Meth) acrylic acid amide	MAM (256)		40	0	40	200	10
	(b) Compound having a reactive unsaturated bond	ST (104) (100)	200	656				
		MMA (108) (105)	651		800	450	700	808
		EA (-70) (-22)	149					
		nBA (-56) (-54)		200				122
		nBMA (20)						
		iBMA (65) (67)						
		2EHA (-35) (-85)		84	100			
		Total	1000	1000	1000	1000	1000	1000
	Theoretical Tg3 (°C)		80 77.6	40 35.3	108 72.3	143 122.0	138 130.5	80
(B) Solvent	(c)	IPA	750	1000	1000	1000	1000	1000
		PM						
	(d)	TOL	250					
		MEK	500	500	500	500	500	500
		TOTAL	1500	1500	1500	1500	1500	1500
Coating solution		Solids content (%)	40	40	40	40	-	40
		Molecular weight (Mw)	47000	45000	31400	27500	-	15000

Please amend Table 2-1 at page 18, as follows:

Table 2-1: Evaluation results of coating film

Evaluation Item		Examples 1 to 8							
		-1	-2	-3	-4	-5	-6	-7	-8
Glass transition temperature:	theoretical Tg3 (°C)	80 <u>75</u>	100 <u>90</u>	120 <u>108</u>	80 <u>76</u>	120 <u>102</u>	100 <u>90</u>	100 <u>90</u>	100 <u>99</u>
	Tg2 (°C) by DSC	130	150	165	120	150	145	145	130
	Tg1 (°C) by rigid pendulum viscoelastometer	175	205	210	115	155	195	195	135
Outward appearance:	transparency	○	○	○	○	○	○	○	○
	Cracking	○	○	○	○	○	○	○	○
Adhesion:	crosscut adhesion test	95/100	100/100	100/100	100/100	100/100	100/100	100/100	100/100
Solvent resistance:	Acetone	Δ	○	○	○	○	○	○	○
	Toluene	○	○	○	○	○	○	○	○
Wear resistance:	Taber abrasion test (CS10, 500 g, number of revolutions)	200	300	400	200	300	400	350	400

Please amend Table 2-2 at page 18, as follows:

Table 2-2: Evaluation results of coating film

Evaluation Item		Comparative Examples 1 to [[6]] 5					
		-1	-2	-3	-4	-5	-6
Glass transition temperature:	theoretical Tg3 (°C)	80 78	40 35	100 72	143 122	130 131	80
	Tg2 (°C) by DSC	85	45	110	during film making	during synthesis	120
	Tg1 (°C) by rigid pendulum viscoelastometer	85	50	105	cracking	Turbid	115
Outward appearance:	transparency	x	Δ	○	○	not measurable	⊖
	Cracking	○	○	○	x		Δ
Adhesion:	crosscut adhesion test	80/100	80/100	80/100	-		90/100
Solvent resistance:	Acetone	x	x	x	-		Δ
	Toluene	x	x	x	-		Δ
Wear resistance:	Taber abrasion test (CS10, 500 g, number of revolutions)	10	20	20	-		50